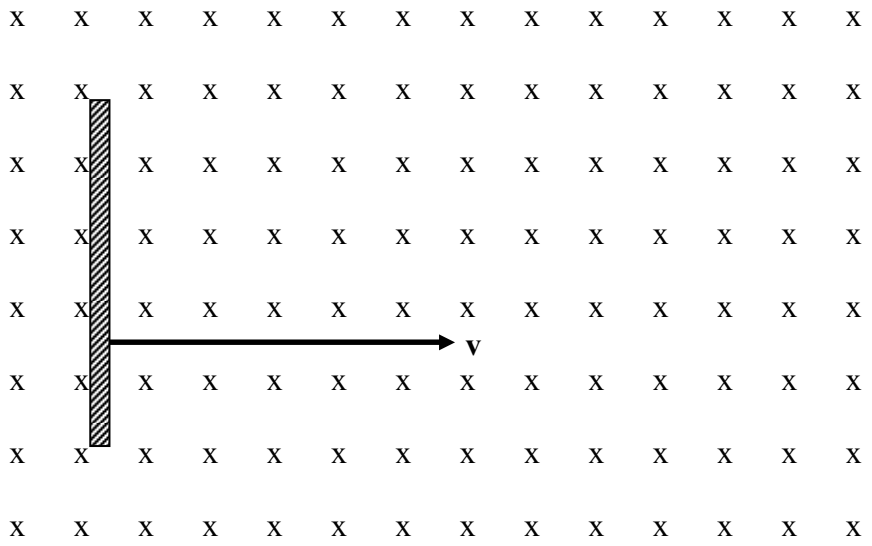
PHYSICS 12 MAGNETIC INDUCTION WORKSHEET 1

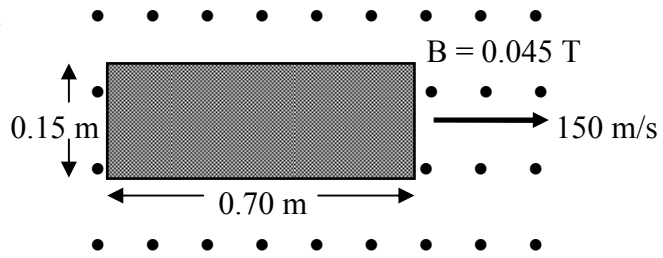
1. A rod 24 cm long moves at 0.56 m/s through a magnetic field of 0.72 T at right angles to both its own length and the direction of the field. What is the potential difference between the ends of the rod?

2. A copper bar 30.0 cm long is perpendicular to a magnetic field of 0.80 T and moves at right angles to both the field and the wire length, producing an EMF of 0.12 V in the bar. What is the bar's speed?

3. A wire 8.0 cm long moves as indicated with a velocity of 2.4 m/s through a magnetic field of strength 0.68 T, which is directed into the page on the diagram below.



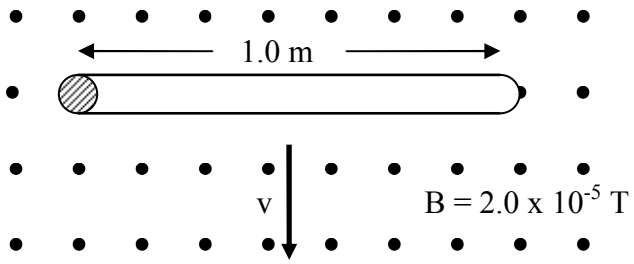
a) What is the induced EMF in the wire?
b) Which end of the wire will become positively charged?
c) What is the magnitude and direction of the electric field inside the wire?

4. 

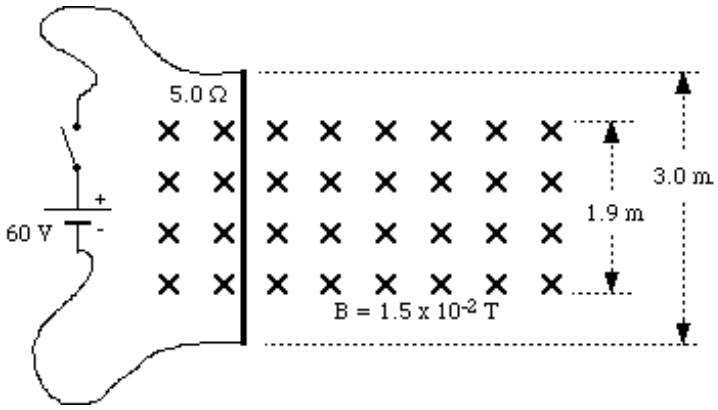
A solid conductor travels at 150 m/s across a uniform 0.045 T magnetic field.
a) Label the side that is positively charged due to the motion.
b) What is the EMF across this block?

5. A 1.0 m long wire held in a horizontal east-west orientation is dropped at a place where the Earth's magnetic field is 2.0×10^{-5} T, due north.

Determine the induced EMF 4.0 s after release.



6. A 3.0 m conducting rod of mass 0.13 kg is attached to a switch and a 60 V source and placed horizontally on a frictionless surface in a magnetic field of 1.5 x 10^{-2} T as shown below (view is from the top).
   a) Determine the acceleration of the rod.
   b) Determine the emf induced in the rod after 0.84 s as a result of its motion.
   c) Use the RHR to confirm the opposing nature of the EMF.



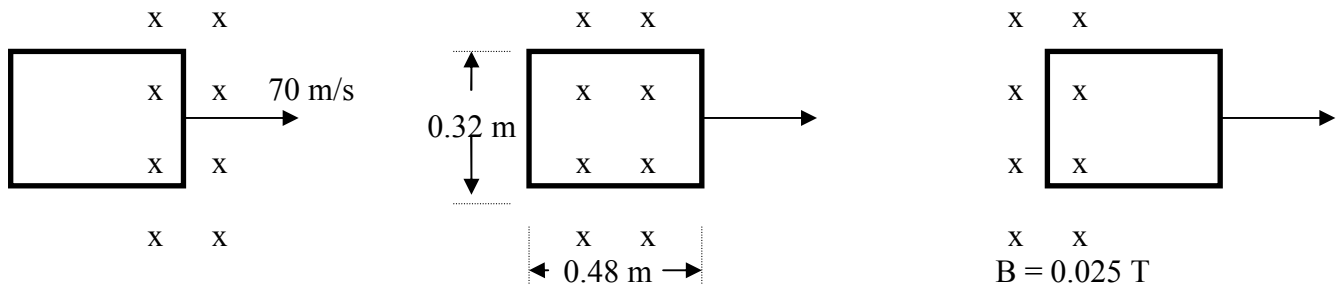
7. A coil of 50 turns is pulled in 0.020 s from between the poles of a magnet where its area includes 31 x 10^{-5} weber to a place where its area includes 1.0 x 10^{-5} weber. Determine the average EMF induced in the coil.

8. A circular flat coil of 200 turns of wire encloses an area of 0.010 m^2. The coil is positioned in a uniform magnetic field of 0.50 T that penetrates the entire coil area.
   a) If the field is shut off so that it drops to zero in 0.20 s, what is the average induced EMF?
   b) If the coil has a resistance of 25 Ω, what current will be induced in it?

9. A circular flat coil has an area of 2.5 x 10^{-5} m^2 and is immersed in a uniform perpendicular 0.40 T downward magnetic field. If the coil has 200 turns, a resistance of 5.0 Ω, and is squashed to a zero area in 0.100 s, what average current will be induced in it during the collapse?

10. A single circular loop of wire with a radius of 4.0 cm sits at right angles in a magnetic field of 0.48 T. If it is removed from the field in 0.12 s, what is the average EMF induced in the loop at that time?

11. A single coil of wire with a resistance of 6.0 Ω travels at a constant 70 m/s through a narrow magnetic field of strength 0.025 T as shown below. For each position, what will the current be, including direction, as it travels in the path indicated? Dimensions of the coil are shown in the middle diagram.



1. 9.7 x 10^{-2} V 2. 50 cm/s 3. a) 0.13 V b) top end c) 1.63 V/m 4. a) bottom side b) 1.0 V 5. 7.8 x 10^{-4} V
6. a) 2.6 m/s^2 b) 0.063 V 7. 0.75 V 8. a) 5.0 V b) 0.20 A 9. 0.0040 A 10. 0.020 V 11. 0.35 A, ccw; 0; 0.35 A, cw